

WHAT IS CLAIMED IS:

- 1 1. A power supply, comprising:
 - 2 an output node operable to provide a regulated supply voltage;
 - 3 a first main-phase drive circuit operable to provide a first main load current to the
 - 4 output node and having an on time and an off time; and
 - 5 a first transient-phase drive circuit operable to provide a first transient load
 - 6 current to the output node and having an on time and an off time that are respectively
 - 7 less than the on and off times of the first main-phase drive circuit.
- 1 2. The power supply of claim 1, further comprising a filter capacitor coupled
- 2 to the output node.
- 1 3. The power supply of claim 1, further comprising a circuit coupled to the
- 2 main-phase and transient-phase drive circuits and operable to pulse-width modulate the
- 3 main-phase and transient-phase drive circuits in response to the regulated supply
- 4 voltage.
- 1 4. The power supply of claim 1 further comprising a circuit that is operable to
- 2 activate the main-phase drive circuit when the regulated voltage strays from a first range
- 3 and is operable to activate the transient-phase drive circuit when the regulated voltage
- 4 strays from a second range that is greater than and includes the first range.
- 1 5. The power supply of claim 1, further comprising:
 - 2 a second main-phase drive circuit operable to provide a second main load current
 - 3 to the output node and having an on time and an off time; and
 - 4 a second transient-phase drive circuit operable to provide a second transient load
 - 5 current to the output node and having an on time and an off time that are respectively

6 less than the on and off times of the first and second main-phase drive circuits and the
7 first transient-phase drive circuit.

1 6. The power supply of claim 1, further comprising:
2 a main filter inductor coupled between the first main-phase drive circuit and the
3 output node; and
4 a transient filter inductor coupled between the transient-phase drive circuit and
5 the output node, the transient filter inductor having a smaller inductance than the main
6 filter inductor.

1 7. A power supply, comprising:
2 an output node operable to provide a regulated supply voltage;
3 a main-phase drive circuit operable to provide a first main load current to the
4 output node;
5 a transient-phase drive circuit operable to provide a first transient load current to
6 the output node;
7 a main-phase filter inductor having an inductance and coupled between the
8 main-phase drive circuit and the output node; and
9 a transient-phase filter inductor coupled between the transient-phase drive circuit
10 and the output node and having an inductance that is smaller than the inductance of the
11 main-phase filter inductor.

1 8. The power supply of claim 7 wherein the inductance of the first
2 main-phase filter inductor is approximately 500 nanohenries.

1 9. The power supply of claim 7 wherein the inductance of the fist
2 transient-phase inductor is approximately 50 nanohenries.

1 10. The power supply of claim 7 wherein the inductance of the first
2 transient-phase inductor is approximately 5 nanohenries.

1 11. The power supply of claim 7 wherein:
2 the main-phase drive circuit has an on time and an off time; and
3 the transient-phase drive circuit has an on time and an off time that are
4 respectively less than the on and off times of the main-phase drive circuit.

1 12. The power supply of claim 7, further comprising a circuit operable to
2 pulse-width modulate the main-phase and transient-phase drive circuits.

1 13. An electronic system comprising:
2 a power supply comprising:
3 an output node operable to provide a regulated supply voltage;
4 a first main-phase drive circuit operable to provide a first main load current
5 to the output node and having an on time and an off time; and
6 a first transient-phase drive circuit operable to provide a first transient load
7 current to the output node and having an on time and an off time that are
8 respectively less than the on and off times of the first main-phase drive circuit;
9 and
10 an electronic component having a voltage supply node coupled to the output
11 node of the power supply.

1 14. A method for powering a load, the method comprising:
2 switching a first current to a load at a first rate and for a first time; and
3 switching a second current to the load at a second rate and for a second time in
4 response to a change in the load, the second rate being higher than the first rate, the
5 second time being shorter than the first time.

1 15. The method of claim 14 wherein:

2 switching the first current comprises switching the first current to the load when a
3 voltage across the load strays from a first predetermined range; and

4 switching the second current comprises switching the second current to the load
5 when the voltage across the load strays from a second predetermined range that is
6 larger than and includes the first predetermined range.

1 16. The method of claim 14, further comprising switching a third current to the
2 load at a third rate and for a third time in response to a change in the load, the third rate
3 being higher than the first rate and lower than the second rate, the third time being
4 shorter than the first time and longer than the second time.

1 17. The method of claim 14 wherein:

2 switching the first current comprises switching the first current through a first
3 inductor; and

4 switching the second current comprises switching the second current through a
5 second inductor that has a smaller inductance than the first inductor.

1 18. The method of claim 14, further comprising filtering the first current with a
2 first inductor and filtering the second current with a second inductor, the first inductor
3 having an inductance an order of magnitude greater than the inductance of the second
4 inductor.

1 19. The method of claim 14, further comprising switching a third current to the
2 load at a third rate and for a third time in response to a change in the load, the third rate
3 being higher than the second rate, and the third time being shorter than the second time.